Smart Wet and Dry Waste Management System (Smart Dustbin) – Synopsis

---

1. Title of the Project

Smart Automatic Wet and Dry Waste Segregation System Using Arduino

---

2. Introduction

Waste management has become one of the most significant environmental challenges in modern society. Improper waste segregation leads to pollution, health hazards, and inefficient recycling. In most households and public places, waste is usually dumped together, making it difficult to separate wet and dry waste later.

This project introduces an **Automatic Smart Dustbin** capable of **distinguishing and segregating wet and dry waste** using an **Arduino-based system**. It ensures segregation at the source, reducing human involvement and enhancing hygiene. By using sensors and microcontroller programming, the dustbin automates the sorting process, making waste management smarter and more efficient.

---

3. Objective of the Project

- To design and develop a dustbin that can automatically separate **wet and dry waste**.
- To promote **efficient waste management** at the source.
- To reduce the need for **manual handling** of waste.
- To create a **low-cost, easy-to-build** system suitable for homes, schools, and public places.
- To demonstrate the integration of **Arduino, sensors, and actuators** in real-life applications.

---

4. Components Required

- **Arduino UNO / Arduino Nano** – Main microcontroller used for controlling the system.
- **Ultrasonic Sensor / IR Sensors** – Used for detecting the presence of waste.
- **Moisture Sensor / Metal Sensor** (based on the video structure) – To differentiate between wet and dry waste.
- **Servo Motor / DC Motor** – For opening the correct compartment or moving a flap.
- **Power Supply / Battery** – To power the components.
- **Jumper Wires** – For connections.
- **Dustbin Structure** – Two compartments: Wet & Dry.
- **Cardboard / Plastic Box / Acrylic Sheet** – For building the housing.

• **LED Indicators (optional)** – To show the bin status.

---

5. Working Principle

The working of the Smart Waste Segregation System is based on **sensor detection** and **microcontroller decision-making**.

Step-by-Step Working:

1. **Waste Detection**:
   When a person brings waste near the dustbin, the **ultrasonic/IR sensor** detects its presence.

2. **Type Identification**:
   Once detected, the system checks the waste type:

3. If the waste contains moisture → It is classified as **wet waste**.

4. If not → It is classified as **dry waste**.

5. **Signal to Arduino**:
   The sensor sends an electrical signal to the **Arduino**, which processes and decides the suitable compartment.

6. **Movement of Flap/Compartment**:
   The **servo motor** rotates to open the correct lid or move the waste guide.

7. Wet waste compartment opens for wet waste.

8. Dry waste compartment opens for dry waste.

9. **Waste Deposition**:
   The waste automatically falls into the correct bin.

10. **Reset Position**:
    Once the waste is deposited, the servo returns to its original position.

---

6. Circuit Explanation

• The **ultrasonic/IR sensor** is connected to digital input pins of the Arduino.
• The **moisture sensor** provides analog readings; these values help determine if the waste is wet or dry.
• The **servo motor** is connected to PWM pin for smooth rotation.
• The **Arduino board** processes the sensor inputs and activates the servo.
• A **power source** (9V battery/USB supply) powers the system.

This simple circuit allows the dustbin to function automatically without constant human supervision.

---

7. Arduino Programming Logic

The Arduino code performs the following tasks: - Reads sensor values. - Compares moisture level to predefined thresholds. - If moisture level is high → classify as WET. - If moisture level is low → classify as DRY. - Controls the servo motor to open the correct compartment. - Uses delays and resets to return the system to normal state.

Even beginners can modify the code for accuracy or add extra features like buzzer alerts, LEDs, or display screens.

---

8. Advantages

- **Improved cleanliness** in homes and public areas.
- **Automatic segregation** eliminates human error.
- **Reduces manpower** required for waste sorting.
- Promotes **environment-friendly disposal habits**.
- **Cost-effective** and easy to build.
- Enhances learning in **electronics, coding, and robotics**.

---

9. Applications

- Homes & Apartments
- Schools / Colleges (Science Projects)
- Hospitals
- Offices
- Public Parks
- Smart Cities Waste-Management Systems

---

10. Limitations

- Moisture sensors may not always identify all types of waste accurately.
- Requires regular cleaning to maintain sensor efficiency.
- Cannot segregate metallic/plastic waste unless upgraded.

---

11. Future Enhancements

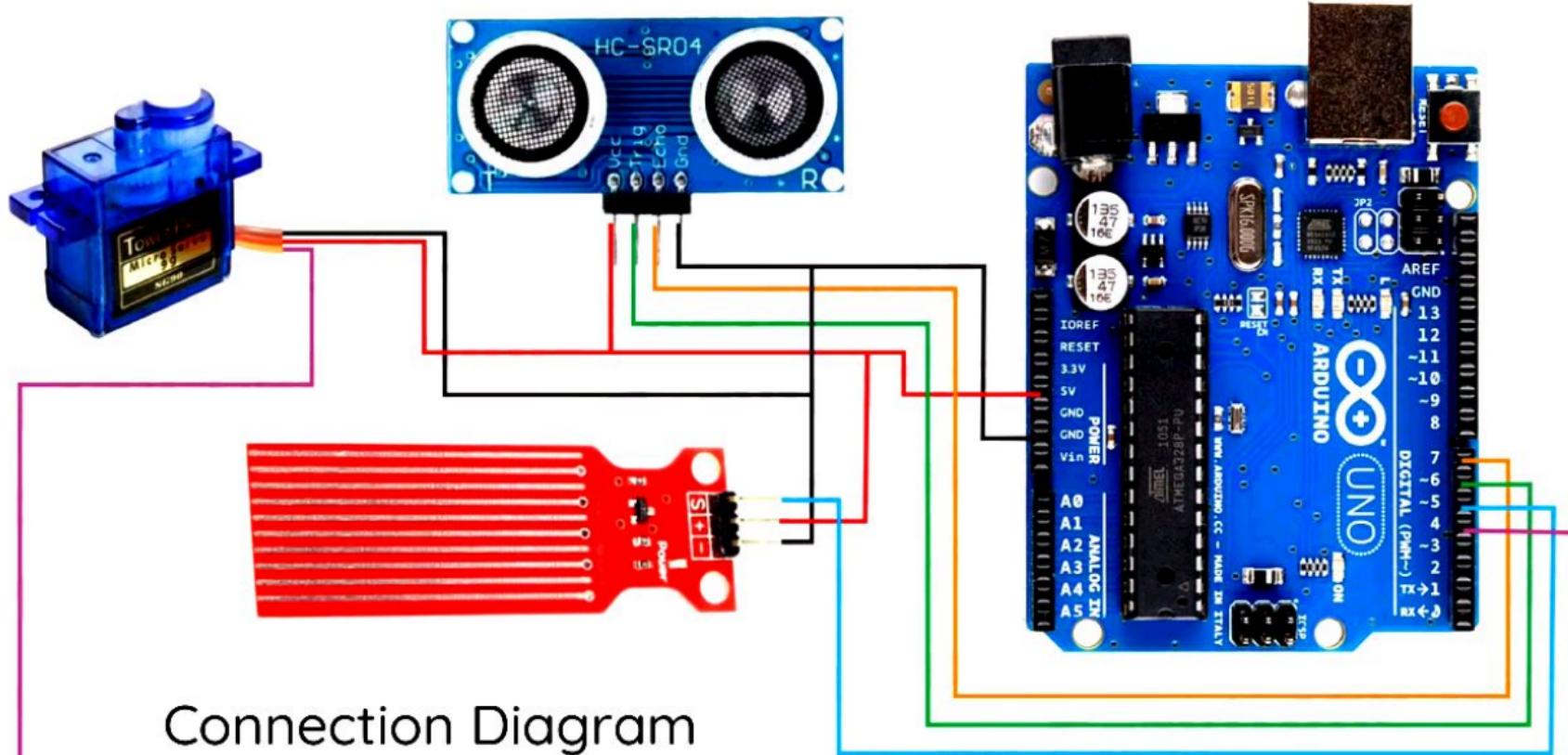- Adding **AI camera-based detection** for better accuracy.

• Using a **conveyor belt system** for continuous sorting.
• Adding **automatic lid opening** with hand detection.
• Including **weight sensors** to measure waste amount.
• Integrating with **IoT** for notifications when the bin is full.

12. Conclusion

The Smart Wet and Dry Waste Segregation Dustbin is an innovative and practical solution for modern waste-management needs. By combining Arduino, sensors, and basic mechanical components, the project effectively demonstrates automation in environmental engineering. It promotes cleanliness, reduces human involvement, and encourages responsible waste disposal.

This project is simple yet impactful—perfect for science exhibitions, school/college submissions, and real-world implementation.

If you want, I can also create a **PowerPoint**, **PDF**, or **Project Report Format** for school/college submission. Let me know!

Connection Diagram